Claims

1. A method of reprogramming a cell, said method comprising the steps of:

(a) incubating a nucleus from a donor cell with a reprogramming media under conditions that allow the removal of a factor from said nucleus or the addition of a factor from said reprogramming media to said nucleus; and

(b) inserting said nucleus or a chromatin mass formed from said nucleus into a recipient cell or cytoplast, thereby forming a reprogrammed cell.

2. A method of reprogramming a cell, said method comprising the steps of:

(a) incubating a chromatin mass from a donor cell with a reprogramming media under conditions that allow the removal of a factor from said chromatin mass or the addition of a factor from said reprogramming media to said chromatin mass; and

(b) inserting said chromatin mass or a nucleus formed from said chromatin mass into a recipient cell or cytoplast, thereby forming a reprogrammed cell.

3. A method of reprogramming a cell, said method comprising incubating a permeabilized cell with a reprogramming media under conditions that allow the removal of a factor from the nucleus or chromatin mass of said permeabilized cell or the addition of a factor from said reprogramming media to said nucleus or chromatin mass, thereby forming a reprogrammed cell.

4. A cell produced using the method of claim 1, 2, or 3, wherein said cell expresses a combination of two or more endogenous mRNA molecules or endogenous proteins that is not expressed in a naturally-occurring cell.

5. A cell that expresses a T-cell receptor or IL-2 and one or more fibroblast-specific proteins.

6. A cell that expresses a neurofilament protein and one or more fibroblast-specific proteins.

7. A cell that expresses the neurofilament protein NF200 and is immortalized.

8. A cell that expresses Oct4 or alkaline phosphatase and one or more fibroblast-specific proteins.

9. A cell that expresses one or more fibroblast-specific proteins and grows in aggregates, forms colonies, or forms embryoid bodies.

10. A method of treating or preventing a disease, disorder, or condition in a mammal, said method comprising the steps of:

(a) incubating a nucleus from a donor cell with a reprogramming media under conditions that allow the removal of a factor from said nucleus or the addition of a factor from said reprogramming media to said nucleus;

(b) inserting said nucleus or a chromatin mass formed from said nucleus into a recipient cell or cytoplast, thereby forming a reprogrammed cell; and

(d) administering said reprogrammed cell to a mammal in need of said cell type.

11. A method of treating or preventing a disease, disorder, or condition in a mammal, said method comprising the steps of:

(a) incubating a chromatin mass from a donor cell with a reprogramming media under conditions that allow the removal of a factor from said chromatin mass or the addition of a factor from said reprogramming media to said chromatin mass;

(b) inserting said chromatin mass or a nucleus formed from said chromatin mass into a recipient cell or cytoplast, thereby forming a reprogrammed cell; and

(d) administering said reprogrammed cell to a mammal in need of said cell type.

12. A method of treating or preventing a disease, disorder, or condition in a mammal, said method comprising the steps of:

(a) incubating a permeabilized cell with a reprogramming media under conditions that allow the removal of a factor from the nucleus or chromatin mass of said permeabilized cell or the addition of a factor from said reprogramming media to said nucleus or chromatin mass, thereby forming a reprogrammed cell; and

(b) administering said reprogrammed cell to a mammal in need of said cell type.

13. The method of claim 3 or 12, wherein said reprogramming media is an interphase reprogramming media or a mitotic reprogramming media.

14. The method of claim 1 or 10, wherein said nucleus remains membrane-bounded and the chromatin in said nucleus does not condense during incubation with said reprogramming media.

15. The method of claim 1 or 10, wherein a chromatin mass is formed from incubation of said nucleus in said reprogramming media.

16. The method of claim 1 or 10, wherein said chromatin mass is incubated in an interphase reprogramming media under conditions that allow a nucleus to be formed from said chromatin mass and said reformed nucleus is inserted into said recipient cell or said recipient cytoplast.

17. The method of claim 3 or 12, wherein said reprogrammed cell is incubated under conditions that allow the membrane of said reprogrammed cell to reseal.

18. The method of any one of claims 1-3 or 10-12, wherein at least 5 mRNA or protein molecules are expressed in said reprogrammed cell that are not expressed in said donor cell or said permeabilized cell.

19. The method of claims 18, wherein said 5 mRNA or protein molecules are specific for a cell type of interest.

20. The method of any one of claims 1-3 or 10-12, wherein at least 5 mRNA or protein molecules are expressed in said donor cell or said permeabilized cell that are not expressed in said reprogrammed cell.

21. The method of any one of claims 1-3 or 10-12, wherein said donor cell or said permeabilized cell is an interphase or mitotic cell.

22. The method of any one of claims 1-3 or 10-12, wherein said donor cell, said permeabilized cell, said recipient cell, said recipient cytoplast, or said reprogrammed cell is an epithelial cell, neural cell, epidermal cell, keratinocyte, hematopoietic cell, melanocyte, chondrocyte, B-cell, Jurak cell, T-cell, erythrocyte, macrophage, monocyte, fibroblast, muscle cell, embryonic stem cell, or adult stem cell.

23. The method of claim 1, 3, 10, or 12, wherein said donor cell or said permeabilized cell is a B-cell, Jurak cell, or fibroblast and said reprogrammed cell is a T-cell.

24. The method of claims 3 or 12, wherein said recipient cell or said cytoplast is an undifferentiated cell.

25. The method of claims 3 or 12, wherein said reprogramming media is a cell extract.

26. The method of any one of claims 10-12 wherein said donor cell, said permeabilized cell, said recipient cell, or said recipient cytoplast is from a human.

27. The method of any one of claim 10-12, wherein said disease, disorder, or condition is a neurological, endocrine, structural, skeletal, vascular, urinary, digestive, integumentary, blood, immune, autoimmune, inflammatory, or muscular disease, disorder, or condition.

28. A method for measuring endogenous alkaline phosphatase protein in a cell, nucleus, chromatin mass, cell lysate, or *in vitro* sample, said method comprising the steps of:

(a) contacting a solid support with a test sample from cell, nucleus, chromatin mass, cell lysate, or *in vitro* sample and with a reference sample, wherein said test sample has a known protein concentration or is derived from a known number of cells, and wherein said reference sample has a known level of alkaline phosphatase protein or activity;

(b) measuring the level of endogenous alkaline phosphatase protein or activity in said test sample; and

(c) comparing said level of endogenous alkaline phosphatase protein or activity in said test sample with the level of alkaline phosphatase protein or activity in said reference sample, thereby determining the level of alkaline phosphatase protein in said cell, nucleus, chromatin mass, cell lysate, or *in vitro* sample.

29. The method of claim 28, wherein said solid support is a membrane or plastic surface.

30. The method of claim 28, wherein said cell is a stem cell.